SANICULA DESERTICOLA, AN ENDEMIC OF BAJA CALIFORNIA

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One of the more restricted species of northern Baja California is *Sanicula deserticola* Bell, known from a few disjunct populations at the northern margin of the Sonoran Desert. One population is known from near El Mármol at the headwaters of the Arroyo de San Fernando, while others are in the yellow hills northwest of Rancho Arenoso and near Rancho Aguajito, both in the drainage of the Arroyo del Rosario. At the last-mentioned locality, it was found growing abundantly on the northwest-facing slopes of a yellow conglomerate hill, 3.6 miles west of Rancho Aguajito (*Raven, Mathias, and Turner 12,678*), associated with *Rosa minutifolia, Euphorbia misera, Yucca whipplei eremica, Idria columnaris, Eriogonum fasciculatum, E. scalare, Encelia californica* var. *asperifolia, Calandrinia maritima, Harfordia macroptera, Brodiaea pulchella, Layia platyglossa,* and *Filago californica*, as well as two species of *Agave* and one each of *Dudleya, Mammillaria, Echinocereus, Echinocactus,* and *Opuntia.* This curious mixture of characteristic members of the California flora and such species as *Idria columnaris,* restricted to the Sonoran Desert, clearly demonstrates the unique ecological position of *Sanicula deserticola.*

The subfamily Saniculoideae of the Umbelliferae, with some 260 species, like the other subfamilies Hydrocotyloideae and Apioideae, has apparently had a long and independent evolutionary history. The distribution of the extant genera of Saniculoideae shows clearly that they have developed within the Arcto-Tertiary Geoflora and have been associated with it for a long time, perhaps since late Mesozoic time when this Geoflora is first recognized in the fossil record. Several of the genera in this subfamily are restricted to areas of Arcto-Tertiary-derived deciduous forest in eastern Asia. Others range south along mountain chains to Africa. The genus *Eryngium* is world-wide in distribution, whereas the genus *Sanicula* is exceedingly widespread in the Northern Hemisphere, with some of its species occurring also in the Southern Hemisphere. Shan and Constance (1951) considered the section *Sanicula* (*Sanicla*), with about one-third of the species of the genus *Sanicula*, the main trunk of the genus. Some species of this section are widespread in Eurasia, and their present distribution suggests development of the section from a northern stock with subsequent southerly migrations. In North America *S. marilandica* L. and *S. trifoliata* Bickn., which Shan and Constance considered probably the least advanced species, occur as common associates of the eastern deciduous forests. The distribution of this section is therefore closely related to that of the Arcto-Tertiary Geoflora.

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In western North America, the genus *Sanicula* is represented by section *Sanicoria*, which Shan and Constance showed was probably derived from members of section *Sanicula*. *Sanicula deserticola* is one of fourteen species comprising section *Sanicoria,* which is the most diverse within the genus in vegetative and reproductive characters. The development of the Madro-Tertiary Geoflora in early Tertiary time in western North America involved a segregation of species from the dry margins of the tropics and from the Arcto-Tertiary Geoflora,—a segregation fostered by the ever-increasing influence of aridity, particularly the loss of summer rain, and of more extreme temperature variation over much of the West (Axelrod, 1958). Increasing environmental diversity in this area has resulted in large measure from the continuation of this process of progressively increasing aridity, and the evolution of section *Sanicoria* was doubtless correlated with the development of this climatic and topographic diversity. Bell (1954) showed that the different diploid species of section *Sanicoria* differ in their environmental preferences. The existence of localized species in specialized environmental situations is unique to this section. Thus *Sanicula peckiana* F. Macbr. occurs only on serpentine, *S. saxatilis* Greene occurs only on volcanic or serpentinized rocks, *S. arctopoides* H. & A. occupies coastal bluff and dune habitats, and *S. maritima* Kell. is a local species confined to moist adobe soil near the coast. Although some species of the section are less sharply differentiated ecologically, they are, as a class, plants of relatively xeric habitats in chaparral and various oak-conifer woodland associations derived from the Madro-Tertiary Geoflora. One species, *S. graveolens* Poepp., ranges widely north and east, and others occur in suitable sites north along the Pacific Coast, but most of the species of section *Sanicoria* are members of the California flora in the broad sense as delimited by Howell (1957). The occurrence of two mesophytic species of *Sanicula* on the western coast of South America is, we believe, the product of relatively recent long-range transtropical dispersal of the type discussed by Grant (1959) and by Raven and Lewis (1959).

On morphological grounds, the species most closely related to *Sanicula deserticola* is *S. bipinnatifida* Dougl., but nevertheless the two are amply distinct. *Sanicula bipinnatifida* is found colonially in open rocky grassland from Washington south to the northern edge of Baja California, in regions with average annual precipitation ranging from about 12 to 40 inches. The populations of *S. deserticola* are about 150 miles south of the range of *S. bipinnatifida* in a region with an average annual precipitation that ranges from perhaps 2 to 7 inches (fig. 1). It is therefore found in a habitat which with respect to aridity is very extreme for members of section *Sanicoria* and for the genus *Sanicula* as a whole. In its native habitat *S. deserticola* probably flowers whenever it has sufficient water. This is suggested by its flowering response when grown at the University of California, Los Angeles, where it flowered twice a year when supplied with abundant water.

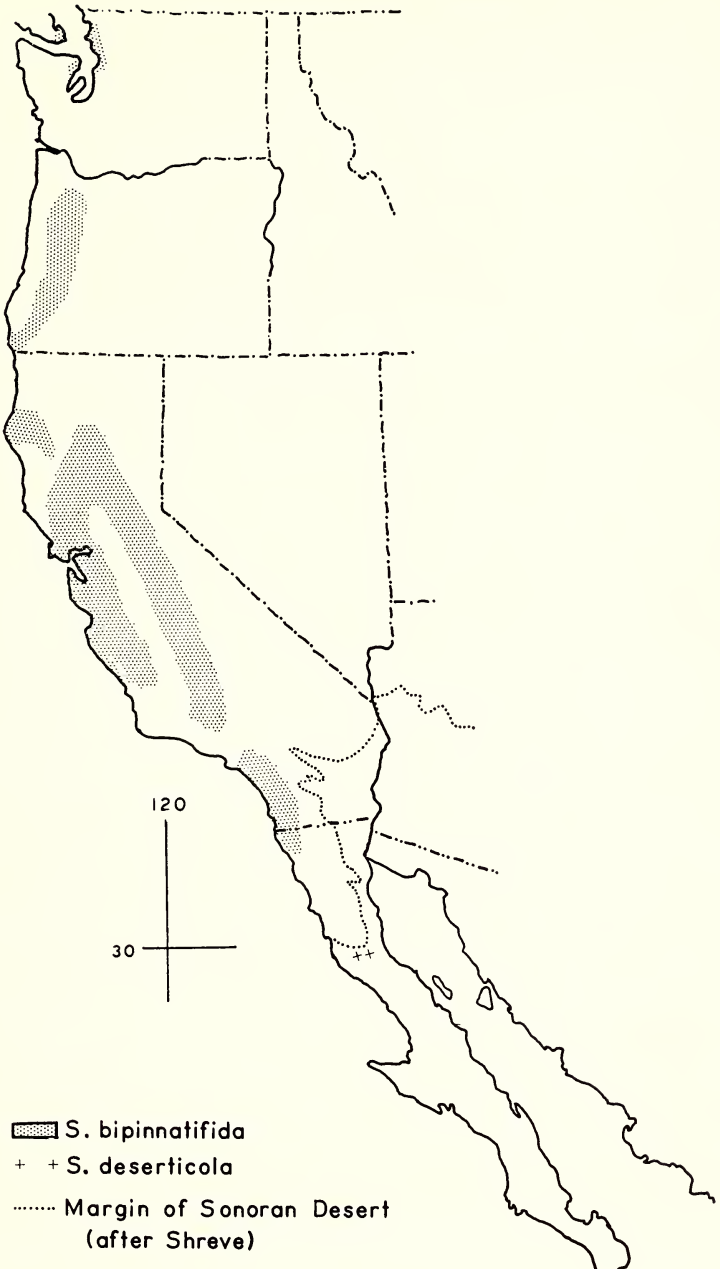

FIG. 1. A portion of western North America, showing ranges of *Sanicula deserticola* and *S. bipinnatifida* and approximate line of demarcation between desert and chaparral in Baja California.

Rodríguez (1957) found that the vessels of *Sanicula deserticola* have the smallest mean length for any member of the family that he examined; this, together with its long taproot and clumped habit, indicate its advanced position compared with *S. bipinnatifida*. One may reasonably infer that populations ancestral to both became differentiated at the southern margins of their distribution in response to an arid climate. The disjunct populations of *S. deserticola* may have been somewhat more continuous during pluvial periods of the Pleistocene, but at which time period this species became spatially and genetically isolated from *S. bipinnatifida* cannot be demonstrated.

The area of *Sanicula deserticola* lies along the southern margins of the transition area between the Californian chaparral and the Sonoran Desert, as defined by Shreve (1936). Shreve noted that species which are endemic in the transition area are preponderantly of northern relationship, while the plants of the desert area are more sharply confined to their own formation. He explained this relationship by the fact that the only requirement for the long southward extension of a chaparral species is a relatively moist habitat, however restricted in area this may be, while the requirements for northward extension of desert species are more complex. The approximate boundary between the two areas is shown in figure 1. *Sanicula deserticola* is certainly such a species of northern affinities. A parallel distributional pattern and relationship are found in the shrubby *Salvia chionopeplica* Epling; this species also consists of a few disjunct populations in north-central Baja California, and it is closely related to other species of section *Audibertia,* such as *Salvia leucophylla* Greene. The distribution of most species of *Salvia* sect. *Audibertia* is associated with the California flora and therefore similar to that of *Sanicula* sect. *Sanicoria*.

Within the genus *Sanicula,* the section *Sanicoria,* apparently stemmed from ancestors adapted to relatively mesic sites within the area of the Arcto-Tertiary Geoflora and occupied successively drier and drier habitats offered by the expansion and differentiation of the Madro-Tertiary Geoflora. The species of section *Sanicoria* that occupies the most xeric habitats is *Sanicula deserticola*. Relatively few perennial Umbelliferae occur in such habitats, and most of those that do are members not of Saniculoideae, but of the larger and more diverse subfamily Apioideae.

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A NEW SPECIES OF VALERIANA FROM BRAZIL

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Valeriana glechomifolia sp. nov. Herba perennis omnino puberula, longe repens; caulis tenuis foliosus; folia opposita, laminis suborbicularibus vel orbiculari-reniformibus, crenato-dentatis, petiolis 0.6–1.4 cm. longis; inflorescentia erecta, 4–10 cm. longa; flores hermaphroditi; corolla infundibuliformis 2–2.5 mm. longa; achaenia oblonga vel elliptica aliquantulum ampulliformia ubique puberulenta; calycis limbus brevicupuliformis plus minusve dentatus.

Uniformly puberulent long-creeping perennial, rooting at the nodes; stems slender, terete, about 1 mm. in diameter, leafy, the internodes 1–2.5 cm. long; leaves opposite, erect or ascending, the blades suborbicular to orbicular-reniform, 0.6–1.5 cm. wide, sometimes truncate at the base, uniformly crenate-dentate, the petioles 0.6–1.4 cm. long; inflorescence an aggregate or compound dichasium, erect, 4–10 cm. long, arising on a slender stalk from leaf axils along the creeping stems, with 1–3 pairs of leaves, the terminal dichotomies about 1–3 cm. wide in anthesis, later more diffuse, the bracts 1–3 mm. long, more or less spathulate, the flowers hermaphroditic; corolla infundibuliform, 2–2.5 mm. long, glabrous, the tube gibbous, the lobes 5, spreading, slightly unequal; stamens 3, exserted, 2-lobed; style 3-lobed; achenes oblong to elliptic, about 1.5 mm. long, somewhat ampulliform, more or less oblique, uniformly puberulent; calyx-limb short-cupuliform, more or less dentate.

Specimens examined. Brazil. Santa Catarina, Mun. Bom Retiro: Campo between Fazenda Campo dos Padres and Fazenda Santo Antonio, Campo dos Padres, alt. 1400–1650 m., November 21, 1956, *L. B. Smith* & *R. Klein 7800* (type US); same locality, January 24, 1957. *L. B. Smith* & *R. Reitz 10383*.

The combination of creeping habit and leaves that resemble those of *Glechoma hederacea* quickly distinguishes *V. glechomifolia* from all other New World valerianas. The fruit of *V. glechomifolia* allies it with other Brazilian valerianas with a coronate calyx-limb in the group with *V. salicariifolia, V. chamaedryfolia, V. foliosa,* and *V. eichleriana,* but the uniformly puberulent and more or less oblique achenes of *V. glechomifolia*